



## **WATER RESOURCES RESEARCH GRANT PROPOSAL**

**TITLE:** Wetlands in urban regions: connections among wetland structure, wetland function and regional water quality.

**FOCUS CATEGORIES:** WL, WQL, ECL

**KEYWORDS:** wetlands, water quality, urban hydrology, rivers, benthic invertebrates, nitrogen, bioindicators, NAWQA

**DURATION:** begin: Sept. 1, 2000 end: Aug. 30, 2002

**FEDERAL FUNDS REQUESTED:** \$115,000

**NON-FEDERAL FUNDS PLEDGED:** \$167,173

**PRINCIPAL INVESTIGATORS:**

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**CONGRESSIONAL DISTRICT:** 6<sup>th</sup>

**ABSTRACT**

Data from the Long Island-New Jersey NAWQA study shows that urban water quality improves as the amount total wetland area in the basin increases. However, it is not known whether the size and placement of individual wetlands within the basin are important determinants of the effectiveness of the wetlands, nor is it known how biotic and functional integrity within urban wetlands correlate with measurements of surface water quality. We propose to analyze forested wetlands within five urban watersheds in New Jersey for which extensive surface water quality data exist through the NAWQA program, in order to accomplish the following goals. (1) Develop a wetland-specific multimetric benthic index of biotic integrity, (2) Evaluate the nitrogen-retention capacity of urban wetlands, as an indicator of the functional quality of such wetlands in water quality protection, (3) Test relationships among wetland biotic integrity ('IBI', indexed using benthic invertebrates), wetland function in water quality protection (indexed by the nitrogen removal capacity), and water quality measurements (including both biotic indices of river health and data on a range of chemical contaminants), (4) test the importance of wetland size and location (adjacent to surface water vs. isolated or headwaters), and (5) use the existing GIS database to evaluate the distribution of wetland patches of different sizes and locations, and statistically test the relationship of these landscape metrics to the NAWQA data on surface water quality. Four wetlands within each of the five urban watersheds will be sampled for the following: (1) benthic invertebrates in both aquatic (ditches, first-order streams) and semi-terrestrial (forested flats) habitats, (2) physico-chemical descriptors of each site, following established methods for the development of indices of biotic integrity, (3) nitrogen inputs in precipitation, groundwater and surface water, (4) nitrogen retention capacity through denitrification, plant uptake and microbial/soil immobilization. In addition, detailed measurements of hydrology (precipitation inputs, water table fluctuations, discharge/recharge patterns, and surface water gauging) will be made in order to evaluate the hydrological connectedness of the wetlands to the surface waters included in the NAWQA study. Multivariate and univariate statistical methods will be used to test the relationships among variable and to develop indices of both invertebrate-based biotic

integrity and N retention capacity. Finally, path analysis will be used to evaluate the relationships among wetland IBIs, riverine IBIs (NAWQA data), wetland hydrology, wetland N retention capacity, riverine water quality, and the landscape distribution of wetlands within a watershed. The results will provide the first direct tests of the relationships between wetland integrity and surface water quality, and the first such data set for urban watersheds. With more than 50% of the American population now living in urban/suburban regions, and that fraction rapidly increasing, it will be increasingly necessary to understand the determinants of water quality protection in urban watersheds, the optimal patterns of wetland distribution in support of water quality protection, and the function of wetlands in urban environments.